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Interactive effects of message framing and information content on carbon offsetting behaviors

Oscar Hengxuan Chi [a,*], Gregory Denton [a], Dogan Gursoy [a,b]

[a] School of Hospitality Business Management, Carson College of Business, Washington State University, Pullman, WA, 99164, USA
[b] School of Hospitality Business Management, Carson College of Business, Washington State University, School of Tourism and Hospitality, University of Johannesburg, South Africa

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ABSTRACT

This study examines the effects of message framing and information presentation on tourists' carbon offsetting behaviors within the theoretical framework of heuristic-systematic processing. The interactive effects of message framing and information presentation are assessed on both static and dynamic outcome variables employing a mixed between-within group methodology utilizing two sets of data through a longitudinal 2 × 2 × 2 experimental design. The results reveal that a gain-framed messaging combined with objective climate change information and objective carbon offsetting information results in significantly more positive impacts on changes in purchase intention of carbon offsetting products and increases willingness to pay for carbon offsetting. Conversely, the combination of loss-framed messages and subjective information presentation are shown not only to be ineffective in increasing carbon offsetting behavior but results in declines in tourists' purchase intention of carbon offsetting products and willingness to pay for carbon offsetting.

1. Introduction

Concern over excess carbon emissions generated by tourism continues to grow (Gössling & Peeters, 2015). The tourism industry risks becoming labeled as a "polluting industry" (Becken, 2004; Kim et al., 2019) and is predicted to generate up to 22% global carbon emissions by 2050 if effective measures are not taken. (Sonnenschein & Smedby, 2018). Even though the worldwide outbreak of COVID-19 has drastically decreased the global carbon emissions (Le Quere et al., 2020), efforts to decrease tourism industry's carbon emissions are still a priority for the vitality and sustainability of the tourism industry (UNWTO, 2020) considering the fact that governments and researchers have been increasingly considering taxing or regulating travel (Dwyer et al., 2013; Gössling & Scott, 2018).

Carbon offsetting has been identified as a potentially effective alternative to regulations or other interventions (Babakhani et al., 2017; Denton et al., 2020). Despite high levels of expressed concerns by travelers over the environment (Gleim and Lawson, 2014; Goldstein et al., 2008), voluntary participation in carbon offsetting programs has been extremely low to-date, and efforts to improve participation levels have been met with limited success, suggesting the existence of an attitude-behavior gap in carbon offsetting attitudes and behaviors (Cheng et al., 2011; Gleim & Lawson, 2014).

Previous research that has explored approaches to promote travelers' carbon offsetting behavior focuses on promoting environmental values (Gössling et al., 2009), designing appropriate carbon offsetting programs (Choi & Ritchie, 2014), and developing government interventions (McKercher et al., 2010). Nevertheless, unlike other pro-environmental activities (e.g., water-saving, recycling), in which users are more likely to see the immediate outcomes of their pro-environmental behaviors and have direct control over those environmental outcomes, the effectiveness of carbon offsetting behavior heavily relies on the program providers. Furthermore, consumers who participate in carbon offsetting programs are not likely to see the outcomes of their participation immediately due to the intangible and the long-term nature of climate change. Moreover, the lack of knowledge regarding the climate science and the concept of carbon offsetting may lead tourists to distrust the consequences of carbon emissions and the benefits of carbon offsetting programs (Denton et al., 2020). The lack of direct control, sufficient knowledge and immediate outcomes may induce perceived uncertainty toward carbon offsetting products. Therefore, compared to other pro-environmental behaviors, effective communication between program providers and tourists is more likely to mitigate the attitude-behavior gap in carbon offsetting. Recent studies have

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* Corresponding author.
E-mail addresses: hx.chi@wsu.edu (O.H. Chi), gregory.denton@wsu.edu (G. Denton), dgursoy@wsu.edu (D. Gursoy).

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suggested the importance of appropriately framed messages to promote emotional arousal toward the carbon offsetting programs (Babakhani et al., 2017) and to increase customers' knowledge levels (Denton et al., 2020). However, previous studies in the field of tourism have reported contradictory findings about the factors that can influence pro-environmental behaviors, especially carbon offsetting behaviors.

First, previous studies have identified inconsistent impacts of knowledge on pro-environmental carbon offsetting behaviors. In general, the lack of knowledge regarding climate change or mitigation strategies is a key factor contributing to the attitude-behavior gap (Denton et al., 2020; Gossling et al., 2009; McKercher et al., 2010). However, simply increasing knowledge levels does not necessarily correspond with a higher environmental predisposition (Pothitou, Hann, & Chalvatzis, 2016), leading to the need to explore other behavioral and attitudinal antecedents to encourage conservation behaviors (Lee & Oh, 2014). Researchers now consider that improving consumer behavior requires further examination into not only the availability of information but the manner in which the information is communicated, highlighting the importance of message framing (Cheng et al., 2011).

However, message framing studies encouraging sustainable tourism behaviors have also produced mixed results and the need exists for further research on how to get tourists more engaged in sustainable behaviors through effective message framing (Dolnicar et al., 2017). Existing research and theories indicate two major causes that may lead to mixed results. One cause is the research context. Although message framing has been identified by social marketing and tourism scholars as an effective method of influencing consumer behaviors (Cheng et al., 2011; Kim & Kim, 2014; Zhang et al., 2018), some studies have revealed an asymmetrical effect of message framing in different research settings (Lee & Oh, 2014) even though most studies argue that people exhibit more sensitivity to losses (e.g., O'Keefe & Jensen, 2008) in risky situations and gain-framed messages may work the best in promoting positive outcomes as suggested by the regulatory fit theory (e.g., Lee & Aaker, 2004). Considering the fact that global warming and climate change poses significant risks, loss-framed messages should be more effective than gain-framed messages in motivating tourists to participate in carbon offsetting programs. However, the hedonic nature of tourism can have significant impacts on the effectiveness of message framing strategies. Since most tourists travel to satisfy their hedonic needs and seek positive experiences, negative message framing may not be appropriate in the tourism context despite the objective of preventing climate change because it conflicts with tourists' primary goals. Gain-framed messaging in this situation might be more effective with tourists and more acceptable to tourism companies. Even though studies argue that the effect of message framing is context-based, the role of hedonic nature of tourism on the effectiveness of carbon offsetting message framing strategies is not clear. Studies conducted to-date applying message framing techniques to tourism have focused largely on recycling (e.g. Grazzini et al., 2018) and water usage behaviors (e.g., Liang et al., 2018). This study aims to address this research gap by assessing the effectiveness of both loss-framed and gain-framed messages in encouraging tourists' carbon offsetting behaviors in order to identify the most effective message framing strategies in carbon offsetting and tourism contexts.

Another cause is the potential interaction between message framing and information types. Studies agree that the way a message is framed can play critical roles in how much persuasion a message can produce (Smith and Petty, 1996). However, since the type of information presented to individuals in a framed message can influence the information processing strategies they utilize, type of information included in a framed message, thus, can result in differential persuasiveness of loss or gain-framed messages. As suggested by the Heuristic-Systematic Processing Model (HSM), individuals who receive objective information about a subject or a topic are more likely to utilize a more systematic approach to process the information included in a message compared to individuals who receive subjective information. Considering the fact that knowledge about climate change and carbon offsetting programs are two critical determinants of individuals' willingness to participate in carbon offsetting programs, there is a need for examining the effects of information type (objective/subjective) included in framed messages about the climate change and carbon offsetting programs on framed message persuasiveness.

The third research gap is methodology related. Existing studies have focused on absolute levels of behavioral intention using cross-sectional data sets. Despite the critical contributions made by these studies, most of them assume that participants in treatment and control groups are homogeneous in terms of pro-environmental attitudes before participating in the study (e.g., Dolnicar et al., 2017; Zhang et al., 2018). This assumption weakens the evidence of the causal relationship between message framing and its outcomes since the time-order of the cause and the effect is blurred (Shadish, Cook, & Campbell, 2002). In addition, although purchase intention is commonly used to predict actual behavior (Ajzen & Fishbein, 1980), in the context of measuring pro-environmental behavior, the purchase intention reported is always inflated due to the normative nature of the study context (Follows & Jobber, 2000). These arguments highlight the importance of examining actual pro-environmental behavior utilizing longitudinal data. However, no studies to date have evaluated relative changes in actual pro-environmental behaviors such as the changes in the amount that travelers are willing to pay for carbon offsetting programs due to the persuasiveness of messages using a longitudinal dataset, leaving the attitude-behavior gap still underexplored.

This study is motivated to fill the three research gaps discussed above. Through the theoretical framework of prospect theory, regulatory fit theory, and the Heuristic-Systematic Model (HSM) of information processing, this study explores the interaction effects of message framing and the type of information (objective/subjective) presented about climate change and carbon offsetting programs on consumers' carbon offsetting behaviors. Furthermore, this study employs a mixed between-within group methodology utilizing data collected before and after the message intervention, in order to measure not only the impact of the manipulations on purchase intention but to also assess the change in travelers' actual pro-environmental behavior.

2. Literature review and theoretical background

2.1. Carbon offsetting in tourism industry

Tourism generates greenhouse gas emissions and is a significant contributor to potential climate change (Becken, 2004; Kim et al., 2019), contributing an estimated 8% of total carbon emissions in 2013 (World Economic Forum) with projected contributions of up to 22% by 2050 (Sonnenschein & Smedby, 2018). One widely recognized strategy for reducing net carbon emissions is that of carbon sequestration or offsetting (Gössling et al., 2009). Carbon offsetting has been criticized by some as a form of "greenwashing" (Segerstedt & Grote, 2016) but carbon sequestration has been shown to be acceptable to consumers (Scott et al., 2016) and capable of capturing a significant proportion of excess atmospheric carbon (Chazdon & Brancalion, 2019). It thus is in the tourism industry's best interests to explore ways to increase participation in voluntary carbon offsetting programs as a way to reduce tourism's contribution to excess atmospheric carbon.

2.2. Purchase intention and willingness to pay for carbon offsetting

Willingness to pay refers to the highest product price or service fee that a consumer is willing to admit (Didier & Lucie, 2008). Willingness to pay has been found to be closely related to purchase intention of pro-environmental products (Barber et al., 2012) and the gap between tourists' intention and their behaviors has been widely documented (Becken, 2004; Juvan & Dolnicar, 2014). Studies find that between 45%

and 70% of travelers express intention to reduce or offset their carbon emissions, but only 3–10% of them engage in carbon-reducing or purchase carbon offsetting products (Gössling et al., 2009; Segerstedt & Grote, 2016). These numbers clearly point to a significant attitude-behavior gap.

Existing studies suggest that the amount consumers are willing to pay for a green product is driven by the product-related information they receive (Kang et al., 2012). Insufficient knowledge leads consumers to feel uncertainty toward the outcome of purchasing (Vermeir & Verbeke, 2006). Even though consumers may have purchase intentions of pro-environmental products, the deficient knowledge regarding climate change, tourism's carbon emissions, and/or carbon reduction options significantly reduce travelers' actual participation in carbon reduction Hares et al., 2010; Juvan & Dolnicar, 2014; Kim & Kim, 2014. Scholars report that when consumers are evaluating a pro-environmental product, a message that can provide consumers with required information not only evokes purchase intention but also motivates them to pay more since the message reduces perceived uncertainty (Kang et al., 2012). Therefore, an adequate message of carbon offsetting products will promote travelers' purchase intention, and more importantly, encourage them to pay a higher amount to reduce carbon emissions.

2.3. Hypothesis development

Message framing involves presenting information to recipients in a format intended to induce a desired interpretation or behavior (Kapuściński & Richards, 2016; Tversky & Kahneman, 1981). A substantial stream of research has explored the effects of message framing on consumer choices (Maheswaran & Meyers-Levy, 1990) and the cognitive processes that underlie framing effects (Zhang et al., 2018). Message framing has been found to be a complex psychological process (Maheswaran & Meyers-Levy, 1990) whereby individuals interpret and react to messages differently depending on how the information is presented (Zhang et al., 2018). Attribute, or valence, framing is the most commonly studied form of framing, and consists of tailoring a message to either focus on the benefits (gains) of engaging in a desired behavior or on the costs or consequences (losses) of not engaging in the desired behavior.

A number of studies have explored the effects of message framing on hotel guests' recycling ((Blose, Mack, & Pitts, 2015); Grazzini et al., 2018; Kim & Kim, 2014; Yoon et al., 2019), booking intentions (Sparks & Browning, 2011), in-room green communication strategies (Lee & Oh, 2014), destination selection and image perception (Amar et al., 2017; Zhang et al., 2018), and towel re-use (Goldstein et al., 2008). However, studies evaluating the relative benefits of gain- or loss-framed messages have shown mixed results. In general, loss-framed messages are considered to be more effective in changing behaviors that are considered risky, while gain-framed messages are considered more effective when behaviors are considered safe (Cheng et al., 2011; Kim & Kim, 2014). Some studies have found effects to be asymmetrical, with consumers showing more sensitivity to losses than to equivalent gains (O'Keefe & Jensen, 2008), while others found that gain-framed messages result in greater engagement (Lee & Aaker, 2004; Lee & Oh, 2014). Other research found no significant effect of message framing (Van 't Riet, 2014).

2.3.1. Gain vs loss framing in tourism pro-environmental products

Global warming and climate change are clearly risky with significant negative outcomes. Therefore, past studies of message framing have suggested that loss-framed messages would thus be more effective than gain-framed messages. However, the nature of tourism and the intangible and the long-term nature of climate change are hypothesized to greatly impact the nature and effectiveness of message framing strategies. Tourism is hedonic in nature, which could reduce tourists' engagement in pro-environmental behaviors (Grazzini et al., 2018). In addition, as a practical matter, negative framing of environmental messages may be undesirable from the perspective of tourism companies regardless of relative effectiveness, as negative messages are contrary to the hospitality industry's objective of having satisfied and happy guests (Blose et al., 2015). This poses a potential paradox in the context of tourism carbon emissions.

Regulatory fit theory suggests that people's engagement in tasks is promoted by the perception of "fit" between their primary goals and the tasks used to achieve those goals (Higgins, 2000). Since most tourists travel to satisfy their hedonic needs and seek positive experiences, negative message framing is likely to be disregarded by consumers despite the objective of preventing climate change because it is not congruent with their primary goals as suggested by the regulatory fit theory. Gain-framed messaging in this situation is likely to be both more effective with consumers and more acceptable to tourism companies. Based on the preceding discussion, we hypothesize that since tourists travel for the purpose of hedonic tourism experiences, gain-framed messages would, therefore, be more effective than loss-framed messages in encouraging carbon offsetting behavior.

H1a. Travelers who receive gained-framed messages that include information regarding climate change and carbon offsetting programs will exhibit significantly higher carbon offsetting product purchase intention compared to travelers who receive loss-framed messages.

H1b. Travelers who receive gained-framed messages that include information regarding climate change and carbon offsetting programs will exhibit willingness to pay significantly higher amount of money for carbon offsetting programs compared to travelers who receive loss-framed messages.

2.3.2. Knowledge about climate change and carbon offsetting programs

Studies argue that levels and types of knowledge about climate change and carbon offsetting programs are critical determinants of travelers' attitudes and behaviors towards those programs (Denton et al., 2020). Although gaps in information among tourists regarding climate change and carbon offsetting practices have been clearly identified (Choi & Ritchie, 2014; Hares et al., 2010; Segerstedt & Grote, 2016), how receiving a message that includes information about both climate change and carbon offsetting programs may influence consumers carbon offsetting behaviors and the amount they are willing to pay for those carbon offsetting programs is not clear. A thorough understanding of the impact of information presented in messages on individuals' participation rates in carbon offsetting programs is particularly important in situations involving high levels of uncertainty and/or incomplete knowledge (Dietz et al., 2007; Ouyang et al., 2017). This is especially true in the climate change context due to its long-term orientation and the immediate intangible nature of climate change. For this reason, a message that contains information about climate change and carbon offsetting programs can provide useful information to tourists about climate change, carbon offsetting programs and their attributes (Ai et al., 2019), which can evoke people's perception of the importance of climate change and the relevance of carbon offsetting efforts.

As suggested by HSM, people who perceive that the information is relevant and important (Chaiken et al., 1989) are likely to process the information they receive intentionally and systematically, which involves a comprehensive analysis of the information and careful deductions, resulting in a high-level of persuasion. In contrast, when people are asked whether they would like to participate in a carbon offsetting program without adequate information may view it as being irrelevant, which can trigger heuristic processing. When consumers evaluate carbon offsetting products, information regarding climate change can lead tourists to have a higher level of perceived importance of the carbon offsetting, resulting in an increasing effort on processing the message. Based on the discussion above, travelers who receive appropriate information regarding climate change and carbon offsetting programs are more likely to exhibit positive behavior toward carbon offsetting products.

H2a. Travelers who receive messages that include information regarding climate change and carbon offsetting programs will exhibit significantly different carbon offsetting product purchase intention compared to travelers who do not receive framed messages that include information regarding climate change and carbon offsetting programs.

H2b. Travelers who receive messages that include information regarding climate change and carbon offsetting programs will exhibit significantly different willingness to pay for carbon offsetting programs compared to travelers who do not receive framed messages that include information regarding climate change and carbon offsetting programs.

2.3.3. The interaction effect on behavior changes

Consumer skepticism due to past instances of "greenwashing" by companies that misrepresented their levels of environmentalism (Ponnapureddy et al., 2017; Rahman et al., 2015) increased the importance of the type of information consumers receive regarding carbon offsetting programs and their format as the stakeholders of the potential carbon offsetting exchange.

Previous information processing research distinguished between objective (factual) and subjective (evaluative) information (Holbrook, 1978). Objective information (e.g., the nicotine level of a cigarette brand) includes a specific statement regarding the fact, whereas subjective information (e.g., the taste of this cigarette is rich) often contains judgments from other people (Edell & Staelin, 1983). Studies have shown that objective information is more credible and has more persuasive power than subjective information because it is processed more systematically (Chaiken et al., 1989). Therefore, the effect of a gain or loss-framed message may differ depending on whether the message contains objective and/or subjective information as suggested by the information persuasion framework. Thus, there is likely to be an interaction effect between information persuasion and gain-loss framing as presented in the conceptual model (Fig. 1) developed based on the preceding discussion. As presented in Figure one, interactive effects of gain or loss-framed messages using objective/subjective information about climate change and carbon offsetting programs will result in significant changes in consumers' willingness to participate in carbon offsetting programs and willingness to pay to offset carbon emissions.

As proposed by HSM theory, people's perceived self-relevance critically drives the outcome of information processing (Chaiken et al., 1989). Besides the information content, the perception of self-relevance can be also affected by people's pre-existing mindset. Scholars find that customers' pre-existing mindset significantly alters the processing of product-related information during shopping (Büttner et al., 2013).

In the current research context, if tourists are in a hedonic, experience-oriented mindset, then gain-framed messages will be congruent with their mindset, leading to a higher level of perceived self-relevance. In contrast, the presentation of a negative-framed message will lead to a conflicted mindset, leading to a self-regulation behavior that prevents people from conducting any further actions that expand the conflict (Kleiman & Enisman, 2018). For this reason, loss framing may prevent tourists from processing the information systematically and decrease the persuasive effectiveness of the message, leading to a smaller change in purchase intention. Based on these discussions, the following hypotheses were developed, and a conceptual model was displayed in Fig. 1.

H3. Gain-framed messages with objective information about climate change and carbon offsetting programs will result in greater change in purchase intentions than any other combination of gain or loss framed messages containing objective/subjective information about climate change and carbon offsetting programs.

The interaction seems to significantly influence willingness to pay. According to the previous discussion, the perceived uncertainty caused by the lack of available information is one of the major factors that cause the intention-behavior gap (Vermeir & Verbeke, 2006). The presentation of objective information (vs. subjective) regarding climate change leads to a higher level of perceived importance. In addition, objective information regarding carbon offsetting programs is more effective than subjective information as a mean of increasing consumers' knowledge. Based on HSM, the combination of this objective information will lead to greater changes in the amount that consumers are willing to pay. Conversely, if a message is loss-framed consumers are less likely to spend effort on processing this objective information due to the incongruence with their mindset (Kleiman & Enisman, 2018). Therefore, the following hypotheses were developed.

H4. Gain-framed messages with objective information about climate change and carbon offsetting programs will result in greater change in willingness to pay for carbon offsetting programs than any other combination of gain or loss framed messages containing objective/subjective information about climate change and carbon offsetting programs.

3. Methodology

This study adopted a scenario-based experimental design and a mixed between-within group methodology utilizing data collected before consumers received manipulated messages and after they received the manipulated messages. A 2 × 2 × 2 scenario-based experiment enabled this study to examine the impacts of different types of information and the interactions among these interventions. In addition, the use of before and after data captured changes in tourists' purchase intentions and willingness to pay in order to assess the causal impact of the message on tourists' pro-environmental behaviors.

3.1. Samples and data collection

This study utilized a student data and an on-line tourist panel to examine the manipulation and the hypotheses, respectively. The pilot

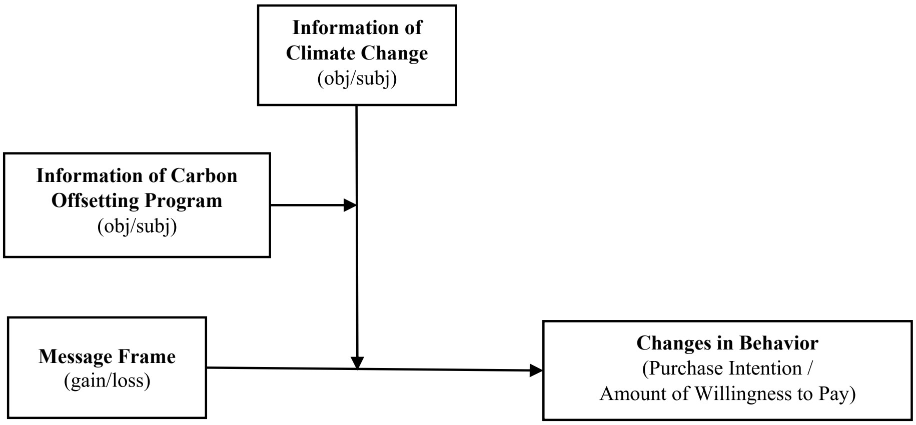

Information of Climate Change (obj/subj)
Information of Carbon Offsetting Program (obj/subj)
Message Frame (gain/loss)
Changes in Behavior (Purchase Intention / Amount of Willingness to Pay)

Fig. 1. Proposed conceptual model.

study data were collected from college students from a public university located in the Northwest of the United States. Each student was required to fill out a paper survey which included a randomly assigned message and they were asked to indicate whether the message was gain or loss framed and whether the information was objective or subjective. Additionally, they rated the understandability and perceived credibility of the messages they received.

The main study recruited participants via Amazon Mechanical Turk (MTurk). MTurk is an online survey platform that is considered to provide a more representative sample of the general population compared to traditional data collection method (Buhrmester, Kwang, & Gosling, 2011) and is reported to be appropriate when testing general principles that do not require samples from a specific tourism context (Viglia & Dolnicar, 2020). MTurk is commonly used by existing environmental studies (e.g., Denton et al., 2020; Wang & Lyu, 2019) and tourism studies (e.g., Ert et al., 2016; Kim et al., 2020). In the current study, a small amount of monetary incentive was offered to participants who completed the online survey and passed the attention checks (e.g., "*This is an attention check question. Please choose 'disagree'*"). Attention check questions have been widely used in social science studies to filter out careless respondents without affecting scale validity (Kung at al., 2018). Participant first completed Part 1 of the survey and then received a randomly generated identification number. After two weeks, participants received one out of eight (2 × 2 × 2) messages followed by Part 2 of the survey. At the end of Part 2, participants entered the identification numbers received in Part 1 to create a longitudinal data format.

3.2. *Carbon offsetting messages*

Eight different combinations of framed messages were used in this study to examine the impact on changes in tourists' purchase intentions and the amount that they are willing to pay for a hypothetical carbon offsetting company. Each message consisted of three interventions: gain (loss) framed persuasive message, objective (subjective) information of climate change and objective (subjective) information about a carbon offsetting program. In gain framed messages, the text highlighted the benefits of purchasing carbon offset products (e.g., "*If you choose to offset your carbon emissions, you will be removing carbon from the atmosphere and helping to preserve our environment*"), whereas, the loss framed messages emphasized the cost of not purchasing carbon offset products (e.g., "*If you do not offset your carbon emissions, you will not be removing carbon from the atmosphere and helping to prevent deterioration of our environment*"). The objective and subjective information were manipulated by providing a message with either more facts (e.g., "*carbon emission levels now exceed 400 parts per million, which has never occurred in the 800,000 years of recorded history*", "*our offsetting is done through Zero Footprint, a private non-profit organization that helps over 100 companies like ours to offset their carbon emissions*") or more evaluations (e.g., "*carbon emission levels have been climbing and many people believe the current levels of emissions are unsustainable*", "*Our offsetting is done through Zero Footprint, a private non-profit organization that many companies use to offset their carbon emissions*").

3.3. *Measures*

In the pilot study, which examined the manipulation effects of the messages, a seven-point Likert bipolar scale was used (1: loss framed, 7: gain framed) to measure the manipulation of gain-loss framed messages. Similar bipolar scales were used to measure the objectivity/subjectivity (1: subjective, 7: objective) of the climate change and carbon offsetting information. Two other bipolar scales were used to examine the perceived credibility (1: not credible at all; 7: highly credible) and understandability (1: not understandable at all; 7: highly understandable) of the information.

The main study assessed the changes in purchase intention and the amount that tourists are willing to pay for carbon offsetting products after the presentation of different messages. For this reason, in Part 1 (time 1) of the study, participants were asked to express their purchase intention and the amount that they are willing to pay for general carbon offsetting products. In Part 2 (time 2), participants read a randomly assigned message regarding a specific product and were asked to express their purchase intention and the amount that they are willing to pay for this product. This study adopted measurement items from existing studies (Lu & Gursoy, 2017) to measure purchase intention (PI) using a 5-level Likert scale. The changes of purchase intention were calculated by using:

$$\Delta PI = PI_{time2} - PI_{time1}$$

The amount that tourists are willing to pay ($WTP) was measured by asking participants to select the amount ($0, $10, $20, or $30) they would spend on the carbon offsetting product. This direct measure approach was appropriate in this study for the following reasons. First, the direct method has been found to have less hypothetical bias than does the indirect method (Schmidt & Bijmolt, 2020). Second, since this study focused on examining the changes in the amount they are willing to pay after reading the messages, direct method allowed this study to accurately calculate and compare the changes, which were calculated by using:

$$\Delta \$WTP = \$\mathrm{WTP}_{\mathrm{time2}} - \$\mathrm{WTP}_{\mathrm{time1}}$$

3.4. *Data analysis*

Independent sample t-tests were used for manipulation checks in the pilot study. The main study utilized correlation and ANOVA with post-hoc comparisons to examine whether the participants who completed different versions of the survey were homogeneous in terms of purchase intention and willingness to pay before reading the message.

To examine the main effect of gain-loss message framing (H1a and H1b) and the main effect of messages (H2a and H2b), this study performed a battery of paired sample t-tests, in which tourists' initial purchase intention and amount that they are willing to pay were compared with the subsequent score after processing gain or loss framed climate change and carbon offset product messages.

Finally, the current study conducted an ANOVA with Post-Hoc tests (Tukey HSD) to compare the effects of different messages on the changes in purchase intention and willingness to pay (H3 and H4). Post-Hoc tests enabled this study to investigate whether one message has significantly better persuasion power than other messages.

4. Results

4.1. *Pilot study: manipulation check*

The pilot study validated the manipulation of messages. Sixty ($n = 60$) students were hired, and each student received a randomly assigned scenario. Thus, the cell size for each type of manipulation (e.g., gain-loss message) was 30. The results of independent sample t-tests suggested that the gain framed messages (mean = 4.93) was significantly more gain focused ($t_{(58)} = 3.16$, $p = .003$) than the loss framed messages (mean = 3.87). The objective-framed information (mean = 5.40) of climate change was perceived to be more objective ($t_{(58)} = 2.99$, $p = .004$) than the subjective-framed information (mean = 4.72). Perceived credibility ($t_{(58)} = -1.67$, $p = .10$) and understandability ($t_{(58)} = -1.08$, $p = .29$) were not significantly different across types. In addition, the objective-framed information (mean = 5.20) of carbon offsetting product was perceived to be more objective ($t_{(58)} = 3.30$, $p = .002$) than the subjective-framed information (mean = 4.07), while the differences in perceived credibility ($t_{(58)} = -2.00$, $p = .51$) and understandability ($t_{(58)} = -1.13$, $p = .26$) were not significant. These findings indicated that the scenarios used by this study were appropriately designed.

4.2. *Main study*

Five hundred and eighty-five (n = 585) participants were engaged in the main study, which tested the proposed hypotheses. Most participants were female (57.9%), aged between 26 and 34 (30.9%), and married (51.3%). A largest proportion of respondents indicated professional occupations (41.0%), undergraduate degrees (38.5%), and annual household above $75,000 (18.9%). This demographic profile is similar to the demographic profiles reported by the previous studies that utilized MTurk (Denton et al., 2020), email survey (e.g., Han & Hyun, 2018) or random sampling approach (McLean et al., 2018).

Moreover, the result of ANOVA and post hoc tests demonstrated that the cell means of purchase intention ($F_{(7,577)} = 1.49$, $p = .17$) and the amount of willingness to pay ($F_{(7,577)} = 0.75$, $p = .63$) across eight groups were not significantly different. These results indicated that the means were homogeneous before the experimental stimuli were administered, suggesting that the findings of this study were unlikely to be influenced by the differences in participants' initial behavioral intentions.

4.2.1. *Main effects of message framing and product messages*

Paired sample t-tests were conducted to evaluate the main effects of message framing and message content. The results of these comparisons are summarized in Table 2.

Results indicated that gain-framed messages produced greater positive effects on purchase intentions (.28 vs .03, $t_{(287)} = 6.53$, $p < .001$) and the amount that subjects are willing to pay (1.23 increase vs .12 decrease, $t_{(287)} = 19.76, p < .001$), providing support for hypotheses H1a and H1b. The results of the main effect of messages indicated that after receiving framed messages that included information regarding climate change and carbon offsetting programs, subjects' purchase intention ($t_{(584)} = 5.18, p < .001$) and willingness to pay ($t_{(584)} = 12.23, p < .001$) significantly increased compared to time 1 data collection, supporting H2a and H2b. The study also found that objective information generally created stronger impacts on attitude and behavior changes than did subjective information, pointing to a discrepancy in the impact of information types (objective vs subjective).

Table 1
Demographic profile.

		Distribution %
Gender	Male	41.9
	Female	57.9
	Other	0.2
Age		
	18-25	16.1
	26-34	30.9
	35-44	26.8
	44-54	13.8
	55-64	9.1
	65 or over	3.2
Marital Status		
	Single	33.7
	Married	51.3
	Live together	8.9
	Divorced	4.4
	Widowed	1.7
Occupation		
	Student	10.3
	Professional	41.0
	Managerial	11.6
	Sales	8.2
	Homemaker	8.9
	Other	20.1
Education		
	Less than high school	0.5
	High school graduate	12.0
	Professional training	1.7
	Some college	29.1
	Undergraduate degree	38.5
	Master's degree	15.9
	PhD/Doctoral degree	2.4
Annual Income		
	Under $15,000	18.6
	$15,000-$29,999	18.6
	$30,000-$44,999	16.4
	$45,000-$59,999	16.1
	$60,000 – $74,999	11.5
	$75,000 and above	18.8

4.2.2. *Comparison of different messages*

To investigate the effects across different messages, ANOVA and Post-Hoc (Tukey HSD) tests were performed to compare the eight messages on the changes in consumer behaviors. The results suggested that different messages lead to significantly different changes in purchase intention ($F_{(7,577)} = 8.81, p < .001$), and the amount that travelers are willing to pay ($F_{(7,577)} = 67.72$, $p < .001$). The Post-Hoc analysis (Table 3) suggested that the gain-framed objective information about climate change and carbon offsetting programs (GOO) lead to significantly higher changes in purchase intention than other messages. In addition, there were no significant differences in the effects on purchase intention across the loss-framed messages. These results supported H3.

Similar results were found in the effects on the change in willingness to pay. The gain-framed message with objective knowledge of climate change and carbon offsetting programs (GOO) was the most effective message in increasing the amount tourists are willing to pay for carbon offsetting programs. In contrast, no difference was found across loss-framed messages. These findings supported H4.

5. Discussion

This study utilized a longitudinal dataset to examine the effects of product messages and message framings on individuals' behaviors toward carbon offsetting products. Using experimental designs, this study reveals a number of valuable and interesting insights into tourists' environmental behaviors.

First, this study illustrates that gain-framed messages show a consistently greater influence on consumer behavior in the context of tourism carbon emissions than loss-framed messages. Moreover, loss-framed messages may reduce the willingness to pay for carbon offsetting products. These findings are consistent with the central tenets of regulatory fit theory and show the importance of devising messages that are congruent with consumers' construal levels in order to avoid the diminished responses that can be triggered by cognitive dissonance and mindset conflicts.

Furthermore, a magnification effect occurs when gain-framed messages are combined with objective information regarding both climate change and carbon offsetting programs. By comparing eight different messages, this study identified the gain-framed objective message of climate change and carbon offsetting programs (GOO) as the most effective message, which increases customers' average willingness to pay by 1.77 standardized units (equivalent to approximately $10.50 US per traveler).

The estimated cell means (Table 4) present several additional insights into the interrelationships between message framing and changes in consumer behavior. Gain-framed messages are shown to have stronger influences on purchase intentions and willingness to pay across all conditions and within each of the simple effects. Furthermore, objective information regarding climate change produces significantly greater increases in purchase intentions and willingness to pay within gain-framed messages. However, within loss-framed messages, the difference between objective and subjective information regarding climate change is not significant. These paired comparisons within simple effects and between individual conditions provide additional evidence that objective information regarding climate change and objective information regarding carbon offsetting programs combined produce synergistically higher increases in carbon offsetting behavior only when

Table 2
Effects of the Predictors on the Purchase Intentions and $WTP.

	n	DV = Purchase Intention				DV = Amount of Willingness to Pay			
		Mean $_{\text{time 1}}$	Mean $_{\text{time 2}}$	*t*	*p*	Mean $_{\text{time 1}}$	Mean $_{\text{time 2}}$	*T*	*p*
Main effect of Product Messages									
Messages	585	3.39	3.54	5.18	**<.001**	2.41	2.96	12.23	**<.001**
Main Effect of Manipulations									
Message Framing-Gain	288	3.40	3.68	6.53	**<.001**	2.41	3.64	19.76	**<.001**
Message Framing-Loss	297	3.37	3.40	0.68	.50	2.41	2.29	−3.86	**<.001**
Climate Change-Obj	284	3.46	3.68	5.36	**<.001**	2.43	3.10	9.33	**<.001**
Climate Change-Subj	301	3.32	3.40	2.03	**.04**	2.39	2.82	8.04	**<.001**
Carbon Offsetting-Obj	291	3.36	3.60	5.97	**<.001**	2.43	2.97	8.26	**<.001**
Carbon Offsetting-Subj	294	3.42	3.47	1.28	.20	2.39	2.94	9.08	**<.001**

Table 3
Results of Post-Hoc (Tukey HSD) Tests for ΔPI and Δ$WTP.

DV = ΔPI	Mean	GOO	GOS	GSO	GSS	LOO	LOS	LSO	LSS
Gain Obj-CC Obj-CO (GOO)	0.65		**−0.54***	**−0.26***	**−0.59***	**−0.60***	**−0.57***	**−0.64***	**−0.59***
Gain Obj-CC Subj-CO (GOS)	0.11	**0.54***		**0.28***	−0.05	−0.06	−0.03	−0.10	−0.05
Gain Subj-CC Obj-CO (GSO)	0.40	**0.26***	**−0.28***		**−0.33***	**−0.34***	**−0.31***	**−0.38***	**−0.33***
Gain Subj-CC Subj-CO (GSS)	0.07	**0.59***	0.05	**0.33***		−0.01	0.02	−0.05	0.00
Loss Obj-CC Obj-CO (LOO)	0.06	**0.60***	0.06	**0.34***	0.01		0.03	−0.04	0.01
Loss Obj-CC Subj-CO (LOS)	0.08	**0.57***	0.03	**0.31***	−0.02	−0.03		−0.07	−0.02
Loss Subj-CC Obj-CO (LOS)	0.01	**0.64***	0.10	**0.38***	0.05	0.04	0.07		0.05
Loss Subj-CC Subj-CO (LSS)	0.06	**0.59***	0.05	**0.33***	0.00	−0.01	0.02	−0.05	
DV = Δ$WTP	**Mean**	**GOO**	**GOS**	**GSO**	**GSS**	**LOO**	**LOS**	**LSO**	**LSS**
Gain Obj-CC Obj-CO (GOO)	1.77		**−0.46***	**−1.01***	**−0.60***	**−1.87***	**−1.91***	**−1.92***	**−1.85***
Gain Obj-CC Subj-CO (GOS)	1.31	**0.46***		**−0.55***	−0.14	**−1.41***	**−1.46***	**−1.46***	**−1.39***
Gain Subj-CC Obj-CO (GSO)	0.76	**1.01***	**0.55***		**0.41***	**−0.86***	**−0.91***	**−0.91***	**−0.84***
Gain Subj-CC Subj-CO (GSS)	1.17	**0.60***	0.14	**−0.41***		**−1.27***	**−1.32***	**−1.32***	**−1.25***
Loss Obj-CC Obj-CO (LOO)	−0.10	**1.87***	**1.41***	**0.86***	**1.27***		−0.05	−0.05	0.02
Loss Obj-CC Subj-CO (LOS)	−0.15	**1.91***	**1.46***	**0.91***	**1.32***	0.05		0.00	0.07
Loss Subj-CC Obj-CO (LOS)	−0.15	**1.92***	**1.46***	**0.91***	**1.32***	0.05	0.00		0.07
Loss Subj-CC Subj-CO (LSS)	−0.08	**1.85***	**1.39***	**0.84***	**1.25***	−0.02	−0.07	−0.07	

Notes *: The mean difference is significant at the 0.05 level.

Table 4
Change in Behavior Attributed to Message Framing.

Carbon offsetting	**ΔPI**	Climate change		
	GAIN	Obj	Subj.	Average
	Obj	0.65	0.4	0.53
	Subj	0.11	0.07	0.09
	Average	0.38	0.24	0.31
Carbon offsetting	**Δ$WTP**	Climate change		
	GAIN	Obj	Subj.	Average
	Obj	1.77	0.76	1.27
	Subj.	1.31	1.17	1.24
	Average	1.54	0.97	1.25
Carbon offsetting	**ΔPI**	Climate change		
	LOSS	Obj	Subj.	Average
	Obj	0.06	0.08	0.07
	Subj	0.01	0.06	0.04
	Average	0.035	0.07	0.05
Carbon offsetting	**Δ$WTP**	Climate change		
	LOSS	Obj	Subj.	Average
	Obj	-0.1	-0.15	-0.13
	Subj.	-0.15	-0.08	-0.12
	Average	-0.125	-0.12	-0.12

combined with gain-framed messaging. Interestingly, the loss-framed messages slightly decrease $WTP by 0.12 units on average, which equals around $0.72 US.

The estimated cell means also reveal discrepant functions of carbon offsetting and climate change information. More specifically, when the information about carbon offsetting is subjective, the fact that the information about climate change is objective or subjective does not seem to be relevant in changing the purchase intention, nor the willingness to pay. However, the fact that the information about carbon offsetting is objective seems to be more important because, if it is combined with an objective climate change message, the purchase intention is higher than when the climate change message is subjective. The same applies to the willingness to pay when combining an objective carbon offsetting information with an objective climate change information, since the intention to pay is higher compared to combining an objective carbon offsetting message with a subjective climate change message. These findings suggest that comparing with using climate change information to increase travelers' perceived importance of carbon offsetting, providing objective information about a carbon offsetting program is more effective in enabling travelers to effectively evaluate purchase options and lead to more positive behavioral outcomes.

Moreover, this study found that a combination of subjective information about carbon offsetting programs and objective information about carbon emissions results in a lower willingness to pay compared to the combination of subjective information about both. As it is discussed previously (section 2.3.2 and 2.3.3), the presentation of objective (vs. subjective) message regarding climate change leads to a higher level of perceived importance of the carbon offsetting program. To make a deliberate purchase evaluation, travelers need detailed information regarding the program that is likely to be included in an objective message. However, when a less effective message (subjective message) is used to evoke travelers' perceived importance of carbon offsetting, travelers tend to engage in more heuristic processing. In this processing route, compare to objective information, peripheral cues about the program (subjective message) are more likely to be used, resulting in an impulsive or unplanned purchase in which travelers exhibit a low change in purchase intention but a higher level of willingness to pay.

This study further compares the impacts of gain-framed messages, loss-framed messages, and the most effective message identified above (gain-framed objective information about climate change and carbon offsetting programs (GOO)) in customer groups with different initial levels of purchase intention and willingness to pay (see Fig. 2). For purchase intention, customers with initial self-reported scores of 1–2 (low to very low), 2.1 to 3 (neutral), 3.1 to 4 (high), and 4.1 to 5 (very high) were categorized into group 1, 2, 3 and 4, respectively. Similarly, for willingness to pay, customers were categorized by using their responses in time 1 ($0 = group 1, $10 = group 2, $20 = group 3, $30 = group 4). The results reveal that the gain-framed message with objective information about climate change and carbon offsetting programs was more effective among respondents who had low initial levels of purchase intentions or willingness to pay, which is arguably the most important target market for carbon offsetting pleas.

Fig. 3 summarizes the changes in willingness to pay caused by messages among the customers (n = 286) who did not want to pay for carbon offsetting products at time 1. Those customers who subsequently received a loss-framed message (n = 132) expressed very little willingness to pay after processing the message and 92% of them remained at the level with no willingness to pay ($0). Whereas all the low initial-intentioned participants who received gain-framed messages (n = 122) showed an increase in willingness to pay. The majority of them (61%) chose to spend $10 after reading the messages. In contrast, customers who received the gain-framed objective information about climate change and carbon offsetting programs (GOO) (n = 32) exhibited the greatest change, 41% of them decided to spend the maximum amount ($30) after processing the message. These numbers indicate that an appropriate message could not only cause an increase in willingness to pay but also motivate the traveler with no initial behavioral intention to participate in pro-environmental activities.

5.1. Theoretical contribution

This study contributes to the literature by furthering our understanding of the drivers behind the attitude-behavior gap that inhibit tourism carbon offsetting participation. This study advances existing theories from three perspectives. First, this study confirms the important role of knowledge in people's pro-environmental behaviors. This study suggests that messages that provide travelers with carbon offsetting program and climate change information result in increases in purchase intention and willingness to pay.

Second, the results of this study explain the previous mixed results regarding the impact of knowledge on pro-environmental behavior, suggesting that the information is effective only when it is properly framed. More specifically, this study reveals a connection between HSM and Prospect theory. The interaction between message framing and information types demonstrates that people process information and make relevant decisions as both rational and irrational agents, simultaneously. That is, people make rational decisions based on the quality and perceived relevance of the information. Whereas, this information processing is also influenced by people's irrational cognition, which is driven by their mindset match. In the context of the current study, a gain-framed message evokes a positive mindset, which is congruent with tourists' promotion-oriented mindset. As a result, this irrational cognition boosts peoples' rational evaluation of the information regarding climate change and carbon offsetting, maximizing the positive outcome of information processing.

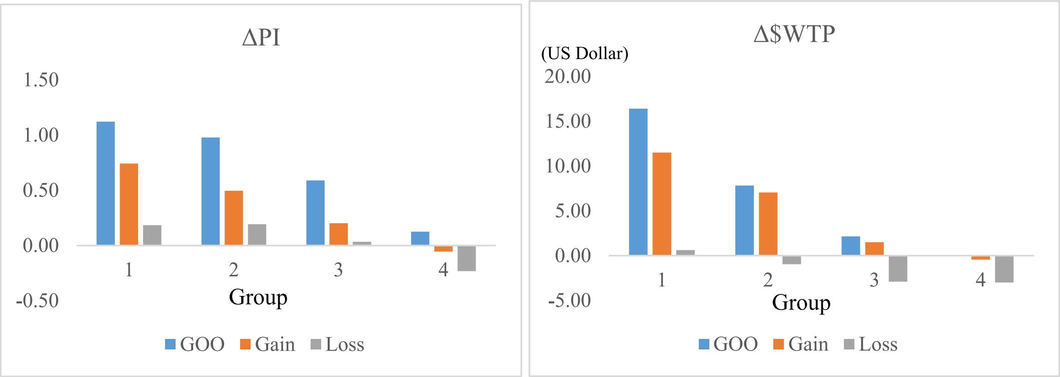
Third, an interaction between regulatory fit theory and prospect theory is found by this study, suggesting that the asymmetrical effect of message framing identified by the previous sustainable tourism research is likely to be caused by underestimation of the effects of travelers' primary traveling goals. This study finds that loss-framed messages conflict with the pursuit of pleasure inherent in tourism and that avoiding dissonance by tailoring message frames to be gain-oriented will contribute to closing the attitude-behavior gap.

5.2. Managerial implication

The tourism industry is considered as a major contributor to global carbon emissions and potential climate change (Kim et al., 2019). World tourism activities currently cause 8% of total carbon emissions and this number keeps increasing (Sonnenschein & Smedby, 2018). Great effort has been made by the tourism industry to reduce its environmental impact through promoting different pro-environmental products such as green hotels (Ouyang et al., 2019) or carbon offsetting programs (Babakhani et al., 2017). However, ineffective promotion of these products has been frequently found to cause negative outcomes, leading customers to have a perception of "greenwashing" (Rahman et al., 2015).

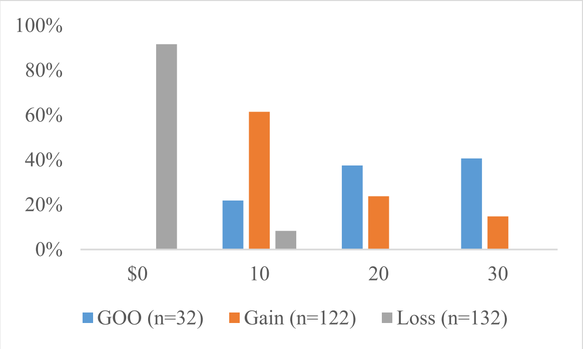
Furthermore, the outbreak of COVID-19 in early 2020 led to a pause in tourism activities worldwide. Nevertheless, due to the stay at home orders reinforced by governments, the reduction of transportation and energy demand drastically decreased the global carbon emission level by 17% in April compared to the average emission in 2019 (Le Quere et al., 2020), giving tourism destinations a break. As a result, the emerging effects of the pandemic is considered as a turning point for sustainable tourism. In the UNWTO Global Guidelines to Restart Tourism from COVID-19, sustainability is a core element and becomes a norm for each dimension of the tourism sector (UNWTO, 2020).

Motivated by the above observations, this study has explored how



Notes: GOO refers to the gain-framed objective knowledge of climate change and carbon offsetting programs.

Fig. 2. Comparation of different messages across different customer groups.



Notes: GOO refers to the gain-framed objective knowledge of climate change and carbon offsetting programs

Fig. 3. Post-message WTP levels among customers with No initial WTP

messages alter customers' pro-environmental behavior in the tourism context with a heavy concentration on addressing the attitude-behavior gap. Findings suggest that message framing can significantly affect customer behavior and reveal the importance of congruency between message framing and the cognitive mindset of the consumers. Based on the results, managers are recommended to develop messages that are consistent with customers' existing mindset such as developing gained-framed messages for customers who are in hedonic experience mindset. This study finds that the gain-framed messages show salient and positive impacts on customers' purchase intention and willingness to pay and, interestingly, the loss-farmed messages lead to a negative outcome since tourists are primarily promotion-focused.

In addition, findings suggest that a combination of objective information about carbon offsetting and climate change in a gain-framed message is more effective in generating higher positive behavioral changes than a combination of mixed types or subjective information only. For this reason, when promoting pro-environmental products, managers will benefit from providing customers with objective informative messages that include, for instance, the current situation of global warming, detailed information about green practices, and the predicted outcomes of purchasing this green product.

6. Conclusion

This study examined the effect of message framing on carbon offsetting behaviors by utilizing three interventions: gain vs loss framing, objective vs subjective information regarding climate change, and objective vs subjective information regarding carbon offsetting products. The 2 × 2 × 2 repeated measure design was performed. The results reveal that gain-framed messages can cause significant positive impacts on purchase intention and willingness to pay for carbon offsetting. In addition, a three-way interaction was found among the three interventions, suggesting that the combination of gain-framed message and conveyance of objective information regarding both climate change and carbon offsetting had an amplification effect, which further increases willingness to pay. This study also identified that the gain-framed objective knowledge of climate change and carbon offsetting programs had the greatest persuasion power.

This study is not free of limitations. First, although this study found that gain framing is more effective in encouraging pro-environmental behaviors, several factors have been identified by researchers as potential moderators or confounds influencing the relationship between message framing and consumer outcomes. The most widely recognized factors include the closeness (distance) of the association that the consumer has with the topic, and the relative importance that the consumer ascribes to the behavior or the potential outcomes. As carbon emissions cannot be touched and seen like towels and recycling bins, and the effects of excessive carbon emissions are uncertain both in terms of scope and timing, the challenge of making carbon emissions important to consumers may be amplified by these factors.

Second, risk framing studies suggest that the negative value of a potential loss is typically greater than the positive value associated with potential gains (Blose et al., 2015; Kahneman & Tversky, 1979), particularly when the perceived risks are high (Lee & Aaker, 2004). Risk is a function of the combination of uncertainty and consequences (Kapuściński & Richards, 2016; Moutinho, 2000), and perceived risk on a personal level has been shown to influence the salience of risk-framed messages (Lee & Aaker, 2004). Since this study has failed to show the effectiveness of loss-framed messages, future studie,s can investigate whether different consequences, such as immediate or delayed consequences, make differences in the effectiveness of a loss-framed message via the mediation effect of perceived risk.

Author contribution

Oscar Hengxuan Chi, Writing - original draft; Conceptualization; Methodology; Formal analysis; Discussion. Gregory Denton, Introduction; literature review; Validation; Writing - review & editing. Dogan Gursoy, Project administration; Writing - review & editing; Resources.

Declaration of competing interest

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Oscar Hengxuan Chi is a Ph.D. candidate in the School of Hospitality Business Management at Washington State University, USA. His interest is in information technology, technology acceptance, wellbeing and sustainability in hospitality and tourism services.

Gregory Denton (B.S. Cornell, M.S. Cornell) is a PhD student at Washington State University. He has lectured on topics including asset management, feasibility studies, and finance, and has published articles in the Cornell Quarterly and the Journal of Retail and Leisure Property, and is co-editor of the textbook on Hotel Asset Management published by the Educational Institute. His research interests include tourism development, sustainable tourism, and real estate.

Dogan Gursoy, Ph.D., is the Taco Bell Distinguished Professor in the School of Hospitality Business Management at Washington State University, USA. His research interest focuses on services management, hospitality and tourism marketing, tourist behavior, travelers' information search behavior, community support for tourism development, cross-cultural studies, consumer behavior, involvement, and generational leadership.